

RESEARCH REPORTS

The persistence of clinical questions across shifts on an intensive care unit: an observational pilot study

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How do clinical questions emerge and move toward resolution in the intensive care setting over the course of 24 hours? In a 20-bed surgical intensive care unit in a large, tertiary-care teaching hospital, informationists shadowed clinicians for 2 48-hour periods to record questions, noting when they were asked and whether they were answered. Thirty-eight percent of 112 recorded questions remained unanswered. Some unanswered questions persisted across shifts, and clinicians' information-seeking behaviors changed over time. Clinical information services can be improved and integrated more fully into clinical workflows based on a fuller understanding of the life cycle of clinical inquiry.

BACKGROUND

Health care providers have many questions about their patients while on their clinical rotations, during their examinations of patients, and in the context of their interactions with the care team on rounds, teaching activities, and handoffs. Questions also arise when they reflect on a patient's case, after their rotations have concluded. Research on clinical questions dates back at least to the 1980s, much of it conducted prior to the advent of electronic access to medical information [1]. Ely, Osheroff, Covell, and others produced seminal works on the information needs of health care practitioners, focused primarily on those in office and ambulatory care settings. They found that although physicians had many questions about each patient, a large percentage of those questions went unanswered [1–7]. Investigations of physician information needs expanded to hospital settings, including emergency departments and intensive care units (ICUs), revealing an increase in the number of questions asked about patients with complex illnesses and the urgency of information

needs in these settings [7–11]. In an ICU, clinical workflow is continual and the need for information related to critically ill patients is constant; yet no research has included physician observation over the entire course of the workday and night.

This pilot feasibility study builds on past research to explore the dynamic nature of the life cycle of clinical inquiry by observing and documenting how ICU clinical team members answer questions about their patients across shifts.

METHODS

Setting

The Weinberg ICU at the Johns Hopkins Hospital in Baltimore, Maryland, is a twenty-bed surgical ICU that provides comprehensive care for critically ill patients admitted from adult surgical oncology, medical specialty, and general surgical services. In the Weinberg ICU, primary multidisciplinary staffing includes attending physicians, clinical fellow intensivists, residents, nurses, and a unit pharmacist, who work in twelve-hour shifts in collaboration with surgical teams and other ICU staff. Clinical daytime coverage includes attending physicians, fellows, residents, and nurses. Evening and overnight shifts reduce coverage to clinical fellows, residents, and nursing staff, with attending physicians on call. As part of a large academic, research-intensive, tertiary-care teaching facility, Weinberg ICU clinical team members manage the care of patients with complex illnesses and participate in various educational activities daily, some formal and structured, and others more informal and spontaneous. In addition to their clinical responsibilities, these practitioners pursue health care and clinical research. All Weinberg ICU staff have twenty-four-hours-a-day/seven-days-a-week access to the Welch Medical Library's electronic resources while on the unit, while working elsewhere on the Johns Hopkins medical campus, and when working off campus. In addition to the collection, the Weinberg ICU staff is supported by an informationist, who provides a variety of services, including library orientations and instructional sessions on how to access, search, and use resources as needed.

Study population and recruitment

The Welch Library research associates, in collaboration with Weinberg ICU clinical directors, developed an institutional review board (IRB)-approved protocol (# NA_00069942) to examine clinical questions that providers have and distributed it to all clinical staff covering the ICU. Professional relationships with these faculty members facilitated the partnership for this study. For example, one of the research associates (Anton) provides informationist service to faculty members of the Department of Anesthesiology and Critical Care Medicine, several of whom serve as attending physicians for the Weinberg ICU.



This article has been approved for the Medical Library Association's Independent Reading Program <<http://www.mlanet.org/education/irp/>>.



A supplemental appendix is available with the online version of this journal.

At the beginning of each study period, prior to the start of morning rounds, the attending physician introduced the research associate to members of the clinical team. The research associate then gave a brief description of the study and invited all members to participate. Invitations to participate continued during the evening and overnight shifts in a similar manner for those clinicians who arrived for their rotations.

Over 2 48-hour observation periods, 19 participants (11 in the first and 8 in the second), all experienced in critical care medicine, voluntarily enrolled in the study, including attending physicians (2), clinical fellows (5), residents/interns (10), nurses (1), and pharmacists (1). Each signed and received a copy of the consent form to participate in the study, and a copy of the protocol was made available. No one approached for recruitment declined to participate. No electronic health records or other sources of protected health information were accessed or used for this pilot study.

Observations

Three research associates (Anton, Woodson, Twose), all information specialists, rotated around the clock to shadow members of the Weinberg ICU primary care team for two consecutive forty-eight-hour periods. One research associate covered each shift (day, evening, and overnight) and observed up to six participants in groups and individually during the shift. Research associates handed off from one shift to the next, to reduce gaps in observation during the study periods.

The research associates informed participants that their clinical questions would be recorded over the course of their shifts, their process to pursue answers would be observed, and the outcome would be noted. All participants were asked to voice questions while being observed during their interactions, so that a research associate could record them on a data sheet. Only questions that required medical knowledge sources beyond the health record were documented. To capture as many questions as possible, if a research associate was not present at the time a question was asked, participants were encouraged to report questions that arose. Research associates also prompted participants for any questions that surfaced during shift changes.

The first study period began on Wednesday, September 19, at 7:00 a.m., coinciding with the start of rotation for the new attending physician on the team, and ended Friday, September 21, at 7:00 a.m. The second study period began Monday, October 1, at 7:00 a.m., ending Wednesday, October 3, at 7:00 a.m., at the end of the second attending physician's rotation. One week separated the 2 study periods to ensure the study of participants from 2 different clinical teams, and for the purposes of reflection and data organization.

Measurements

Over the course of the two forty-eight-hour periods, research associates recorded questions that required medical knowledge sources beyond the health record and collected data about each question: Was the

question answered immediately, pursued later, or remain unpursued (by the end of the study period). If a question was answered, associates recorded what resource was used and whether the clinician deemed the answer useful.

The research associates also recorded the role of the clinician asking the question (attending, fellow, resident, nurse, or pharmacist); the shift (day from 7:00 a.m.–3:00 p.m., evening from 3:00 p.m.–11:00 p.m., and overnight from 11:00 p.m.–7:00 p.m.); and a brief description of the activity during which the question arose. Participants engaged in a broad spectrum of clinical activities including morning rounds, small group gatherings to review radiologic films of patients, "pre-rounds" and case hand-off discussions between team members rotating on and off shifts, laboratory review, "curbside" consultations, and admission periods of new patients to the unit. Brief didactic sessions, or "teaching prescriptions" led by an attending physician, were conducted on the unit daily.

Research associates recorded the order in which the questions arose but did not record any other relationships among the questions asked within the same shift or between shifts. Associates followed up with participants and recorded their responses related to the resources used and their judgment as to the utility of the answers they found. A copy of the data recording sheet is included as supplementary material (Appendix, online only).

Beyond the recording sheets, covering each shift on the unit allowed observation of the participants' conversations in the ebb and flow of their daily work. Knowledge thus gained deeply enriched the authors' understanding of what is involved in answering questions. Conversations with the participants also provided insight into their thought processes as a working team.

RESULTS

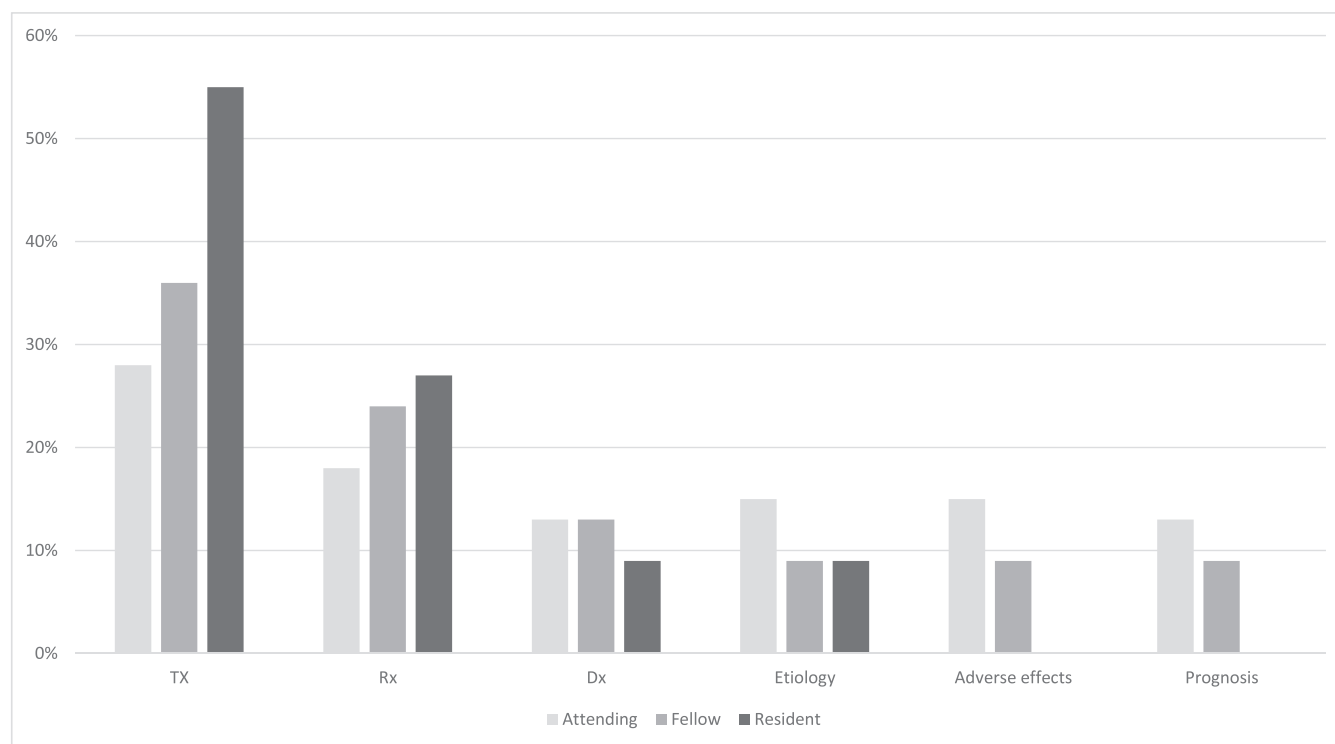
The research associates recorded a total of 112 questions from the 2 study periods. Of those, 70 questions were either answered immediately ($n=45$ or 40%) or pursued later ($n=25$ or 22%), leaving the remainder ($n=42$ or 38%) unpursued.

Each of the 19 participants asked at least 1 question. The number of questions asked varied by team member status, with attending physicians and clinical fellows asking the majority ($n=40$ or 36% and 45 or 40%, respectively), followed most closely by residents ($n=22$ or 20%). Of the 70 answered questions, the majority were asked during the day shift ($n=31$), followed by overnight ($n=22$) and evening ($n=17$) shifts.

Those questions that were not answered immediately reflected similar shift results, with the majority ($n=13$) pursued during the day, followed by the overnight ($n=10$), and evening ($n=2$) shifts.

The authors identified 4 general activities during which questions were asked: rounds ($n=54$), case review ($n=19$), teaching ($n=15$), and curbside consultation ($n=24$).

Figure 1
Types of questions asked by physician role



Participants were satisfied two-thirds of the time when they looked up an answer from a resource (23 of 37 observed instances). PubMed (n=10 or 26%), Google (n=10 or 26%), UpToDate (n=7 or 18%), Wikipedia (n=4 or 10%), and other evidence-based sources (n=2 or 5%) were the most frequently queried online sources. They also accessed known journal articles, practice guidelines, handbooks, pocket guides, and handwritten notes (n=6 or 15%) to answer questions.

The research associates used a standard classification to describe types of questions, including treatment, medication, prognosis, etiology, diagnosis, and adverse effects. Treatment and medication questions were the largest percentage for all roles: residents 80%, fellows 60%, and attending physicians 46%. Medication-related questions accounted for an additional 27%, while etiology and diagnosis each accounted for 9% of their questions. Attending physicians and fellows had similar profiles with treatment at 28% and 36%, respectively; medication 18% and 24%; prognosis 13% and 9%; etiology 15% and 9%; diagnosis 13% for both; and adverse effects 15% and 9%. Fifty-five percent of residents' questions concerned treatment. Residents did not ask questions about prognosis or adverse effects. There were not enough questions from the nurse and pharmacist to produce reportable results by their roles (Figure 1).

Analysis of the 112 questions also revealed that at least 15% were recurrences of earlier queries with slight variations. That is, these questions persisted,

being raised by various participants over the course of a shift and even across multiple shifts until finally being answered. These identified persistent queries began on rounds but resurfaced 1 or more times, up to 4 shifts later. Each of these questions tended to revolve around a single condition, and as treatments progressed, more specific sub-questions surfaced.

DISCUSSION

This observational study examined the questions arising from an ICU clinical team's members across shifts to explore how information needs and information-seeking behaviors change over the course of twenty-four hours. The authors recorded the life cycle of questions from their contexts to how they were pursued, deferred, or abandoned, and if they were answered satisfactorily.

Nineteen participants asked 112 questions about their patients, conducted over consecutive shifts during 2 48-hour observation periods on an ICU. Seventy (70) questions (62%) were either answered immediately or pursued later. The authors estimated that 15% of all questions persisted across shifts until they were answered. This finding—that questions persist across shifts—does not appear to have been recognized or examined in the existing literature on information-seeking behaviors of clinicians. This study confirms prior research that clinicians ask more questions about patients in their care than they answer [1, 3–5, 7].

A prospective study that examined outcomes from the role of a clinical librarian participating on inpatient rounds found that physicians who treated patients with complex illnesses asked more questions and utilized the skills of a librarian to pursue answers [11]. Similarly, observations in the current study suggest that questions that resurfaced over the course of shifts primarily focused on “non-pathway” patients, a term heard repeatedly from participants describing patients with complicated cases who were not responding well or who had experienced adverse effects related to a treatment course. Conversely, the authors speculate that some of the questions that went unanswered did so because they concerned “pathway” patients, those individuals who were improving or responding positively to treatment.

The timeliness of and methods by which physicians answer clinical questions have also been studied. These studies suggest that online literature search skills and the dissemination of evidence supporting clinical information needs at the point of care lead to a significant reduction in health care costs and shorter lengths of stay [12, 13]. Other studies have identified the importance of complete communication of patient information during shift hand-offs as critical to patient safety [14, 15]. These findings are particularly noteworthy in relation to the current study's observations, since it is during these transition of care activities when a question can either persist with an opportunity to be answered or else be dropped.

Barriers to answering questions have also been examined in the literature, ranging from doubt that an answer exists to the failure of a selected source to provide an answer [4, 5]. In this study, participants were observed using quiet periods overnight as well as unit “down time” to pursue questions. This observation agrees with a survey study that revealed that physicians were unlikely to stop during a patient encounter to look up information on the Internet but instead waited for a break or after work at home [16].

Limitations of the study

There were two limitations to the current study. First, because only one research associate was on the unit at a time for each shift, it was not possible to simultaneously shadow every study participant. Second, due to the duration of the study period, questions recorded as unanswered may in fact have been answered, but after the study ended.

CONCLUSIONS

This pilot study contributes to existing research on clinical questions and health care providers' information-seeking behaviors. The recognition that questions can persist across shifts developed during the data analysis. The authors intend to explore this phenomenon more fully, using similar shadowing methods. The authors plan to examine issues related to the effect of unit activity on questions as well as

how unanswered questions are handled and change over time.

By experiencing the life cycle of clinical inquiry over the course of shifts, information service delivery to practitioners can be improved and integrated more fully into clinical workflows, contributing positively to health care outcomes.

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